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GALLS AND INSECTS PRODUCING THEM.

Melville Thurston Cook.

Part III. Lateral Bud Galls.

In Part II of this series of papers I gave a discussion of apical bud galls. The lateral bud galls differ from the apical only in point of location; therefore, this (Part III) may be considered a continuation of Part II. There is, however, considerable difference in the galls dependent upon the order and genus to which the insect belongs and to the part of the plant which is attacked by the enemy. These differences may be summed up briefly as follows:

(1) Affection of the tip of the stem causing it to remain in its incipient condition and the leaves to remain aborted, instead of lengthening. This is well illustrated by the apical bud galls of *Cecidomyia solidaginis* Lw. on Solidago; *Cecidomyia salicis strobiloides* O. S. on Salix; and *Callirhytis clavula* Fitch on Quercus alba. (Part II, Figs. 31, 32, 33.) In these cases we have two orders of insects represented but producing similar galls: this, as previously explained, is no doubt due to the fact that the insects affect corresponding parts of the host plant.

(2) Affection of the tip of the bud causing it to remain short but to become large and globular. This is well illustrated by *Holcaspis globulus* Fitch (Fig. 34, a, b, c.) By collecting specimens of this gall in April or early part of May it is easy to demonstrate that the gall is in reality an enlargement of the stem part of the bud. The insect evidently deposits the egg in the apical part of the incipient stem. This causes the stem to enlarge, forming a globular body, but to remain so short as to form a sessile gall on the main stem. The bud scales are at first very prominent but gradually shrivel up and are lost, leaving a naked,

especially if the collections were extended over other months of the year. Some records of Hemiptera have been made, but they cannot be considered as in any way exhaustive at the present time. Extensive collections have been made of the Diptera by Prof. J. S. Hine, but no record as yet is published.

It will be seen from this that scarcely anything has been done in the way of exhaustive study of any one of the groups of worms, crustaceans, mollusks, and a great majority of the groups of insects, in all of which we may be sure that there is an enormous aggregate of species represented.

It appears to me that a systematic survey of the locality is not only possible but that with the large number of students visiting the locality each year we may hope for rapid progress, provided there is definite cooperation to that end. With regard to the value of such studies, we may say that the locality possesses some very unique features and is an exceptionally fine locality for flora, as has been shown by Professors Moseley, Kellerman and others. Many peculiar occurrences of animal groups have been noted that will greatly extend the main distribution of many of the species. To those familiar with the region it is unnecessary to speak of the peculiar and varied conditions presented, but for those who have never visited the locality it will be proper to state that the remarkable conditions are due largely to the presence of an extended stretch of sand—Cedar Point, which extends from six to seven miles and encloses the east arm of Sandusky Bay. This Point is virtually an extended sand dune, or series of dunes, with a flora entirely characteristic of sand dune formations; that the arm of the Bay it encloses is to a considerable part an extended marsh so closely enclosed by islands, points and vegetable growth that the waters are very largely undisturbed.

Within the other arm of the Bay we have the outflow of Sandusky River and a more or less rocky shore with limestone soil, which contrasts strikingly with the sand formations of Cedar Point. Another striking condition is offered in the level prairies in the vicinity of Castalia. On the whole there is, within a radius of five miles of the city of Sandusky, a variety of conditions which it would be hardly possible to duplicate anywhere in the interior of the United States, and which makes possible a great variety of biological studies.

I may add that it is the purpose of the University to develop the biological station, and to this end it desires to make the station accessible and useful to every biological student and especially those who are connected with the colleges and schools of Ohio.

The members of this academy particularly should feel a sense of proprietorship in the station and are most cordially invited to take advantage of its opportunity.

THE DEVELOPMENT OF THE EMBRYO-SAC AND EMBRYO OF AGROSTEMMA GITHAGO.*

MELVILLE THURSTON COOK.

Agrostemma githago L. was selected as a plant for comparison with Claytonia virginica, they usually being placed in the same order but in different families.

The ease with which the material can be prepared and the regularity of the development of the embryo-sac and embryo make it a very desirable plant for study.

METHODS.

The material was killed and fixed in Flemming's solution and in chromo-acetic, passed through the alcohols, imbedded in paraffin, cut on a Minot microtome and stained in aniline safranin and gentian violet, and also in Hadenhaine's haematoxylin and iron alum. For the development of the embryo-sac the safranin and gentian violet combination was most desirable, but for the development of the embryo either stain was satisfactory.

The young buds were killed entire, but the sepals and petals were removed from the older ones. In the very youngest stages it is desirable to cut the sections thin, but when the embryo-sac has reached the eight-celled stage it must be cut thick, otherwise important structures may be lost. The orientation was very simple; by cutting the ovaries transverely the sac will be cut longitudinally.

The archesporium may originate as one, but more frequently as two or three, hypodermal cells (Figs. 1, 2, 3). These increase in size (Fig. 2), and one eventually absorbs the others. Many specimens were examined, but in all cases only one cell developed into an embryo-sac. This single archesporial cell now divides by transverse divisions into three cells, of which the lowest develops into the functional megaspore (Fig. 4.) The two (Fig. 5), four (Fig. 6), and eight (Fig. 7) celled stages of the embryo-sac are formed in the usual manner. The sac increases in size very slowly up to this time, and the nuclei of the sac are of practically the same size (Figs. 6 and 7), except that antipodals are slightly smaller than the other nuclei.

After the formation of the megaspore the ovule begins to enlarge, and a very pronounced growth of the nucellus and integuments on the micropolar side projects from the micropyle. The embryo-sac is thus left deeply imbedded in the nucellus (Figs. 4 and 23). By the time the sac has reached the two-celled stage the nucellus shows two well-defined zones (Figs. 5 and 23). The inner zone surrounding the sac is made up of thin-walled cells, which degenerate for the enlargement of the sac which occupies the entire inner zone in the eight-celled stage (Fig. 7). The walls of this inner zone were so delicate that it was difficult to get good preparations of the eight-celled stage. The outer zone is made up of thicker walled cells, which are more permanent and which are in more or less regular rows, which radiate from the inner zone. The inner zone is connected with the micropolar end of the ovule by two or three rows of elongated cells, which degenerate to form the path for the pollen tube (Figs. 5 and 23). After fertilization the part of the nucellus projecting through the micropyle degenerates and the integuments come together at that point.

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* Contribution from the Botanical Laboratory of Ohio State University. XII

Lyon* describes an enlargement of the ovule similar to that in Euphorbia corollata, except that there is no zone-like structure, and the cells which break down for the passage of the pollen tube are larger and looser than the surrounding tissue.

After the conjugation of the polar nuclei the sac enlarges on one side and at right angles to its long axis (Fig. 24). The endosperm nucleus passes down into this pocket, divides and eventually forms a peripheral endosperm (Fig. 18). One case was observed where the endosperm nucleus had failed to divide, although the embryo was in its five-celled stage. At the lower end of this newly formed pocket a mass of endosperm is formed, which probably hastens the absorption of the nucellus at that point (Fig. 19). At this time the egg has enlarged considerably; the synergids remain about the same size and disappear very early; in only one case was a synergid observed to persist until after the formation of the first transverse wall in the embryo. By the enlargement of the sac in the new direction the antipodals are left in a small pocket (Fig. 24*a*); they degenerate, sometimes by fragmentation, and eventually disappear.

The pollen tube was observed a number of times, always following the canal formed by the absorption of the cells previously described, but in no case was I able to observe the act of fertilization.

EMBRYO.

The fertilized egg divides by transverse wall, the lower cell enlarging into a large basal cell (Fig. 8). The upper cell now divides by transverse division (Fig. 9). This is followed by a series of transverse divisions, the order of which I could not determine, resulting in a filamentous embryo of five, six or seven cells, with one large basal cell (Figs. 19, 11, 12). When the embryo has reached this condition the cell next to the upper cell divides by a longitudinal wall (Fig. 13). The cell next below now divides in a similar manner, while the two cells next to the top divide again so as to form a quadrant (Fig. 14). The upper cell is the next to divide by a longitudinal wall (Fig. 15), and this is followed by a division of the fourth cell from the top (Fig. 16). Repeated longitudinal divisions now result in the spherical embryo made up of five tiers of cells (Figs, 17, 18, 20). In the meantime the suspensor has elongated by transverse divisions, but the large basal cell remains unchanged (Figs. 18, 20, 21, 22).

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* Florence May Lyon. A Contribution to the Life History of Euphorbia corollata. Bot. Gaz. 25, 6. 1898. pp. 418-426.

This spherical embryo now enlarges by both longitudinal and transverse divisions in the different tiers until the appearance of the cotyledons, when it begins to elongate (Figs. 21, 22 and 25).

The cotyledons develop in the typical dicotyl manner on opposite sides and at the summit of the spherical embryo, and with the plumule between. At the same time the calyptrogen begins to develop in the row of cells next to the suspensor, giving rise to a well-developed root-cap. The embryonic tissues are quite distinct; the dermatogen, periblem and plerome being easily recognized. At about this time the suspensor disappears, and the embryo elongates and becomes very much curved in the embryo-sac, the inner cotyledon being slightly shorter than the outer one (Fig. 26).

It will be easily seen that there is very little similarity between the development of the archesporium, the ovules or the embryo of Agrostemma githago and Claytonia virginica, the embryonic development being entirely different. The embryo of A. githago resembles in general appearance the embryos of Cruciferae as represented by Capsella and Alyssum.

I wish to express my thanks to Prof. J. H. Schaffner, of the Ohio State University, for many valuable suggestions in this study.

CONCLUSIONS.

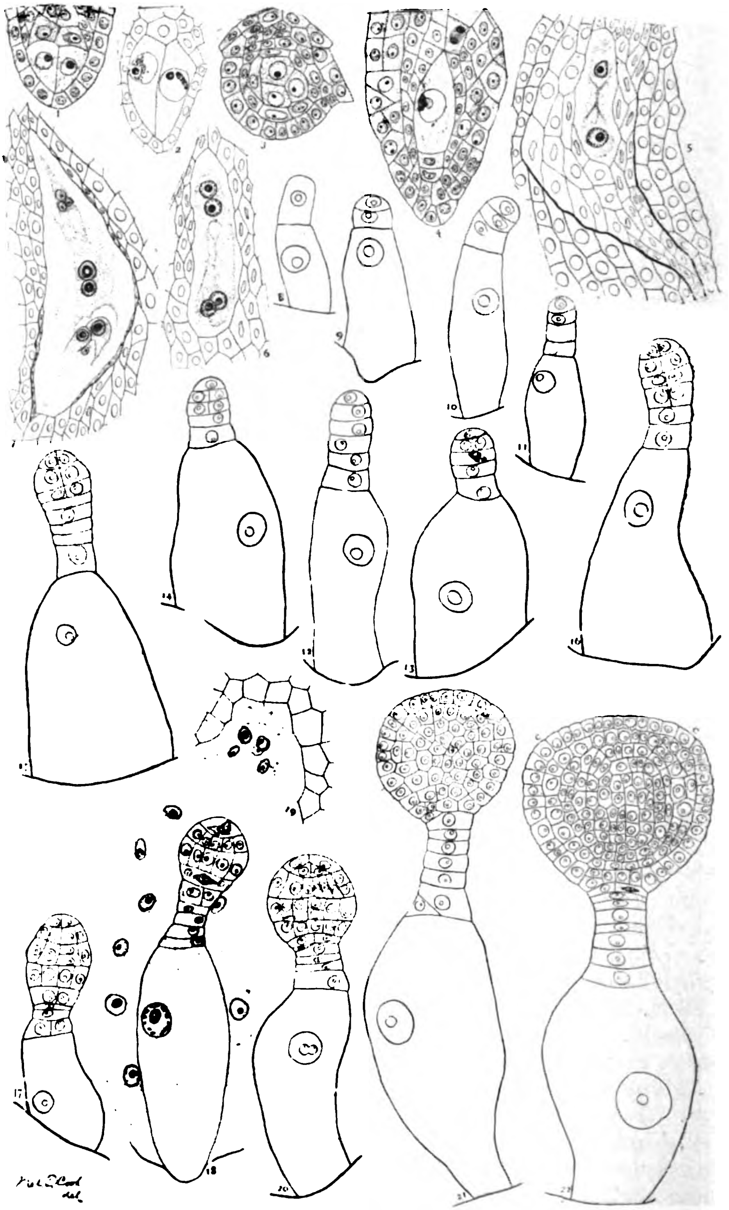
1. The archesporium develops as one, two or three cells, of which all but one are absorbed.

2. The sac is formed from the one remaining archesporial cell in the usual manner. After the formation of the eight-cell stage, the enlargement of the sac is from one side and at right angles to the original long axis.

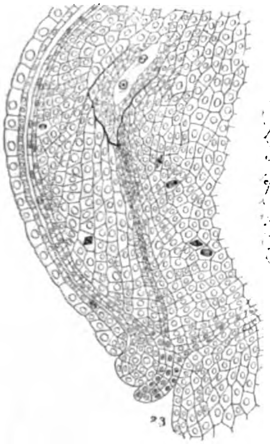
3. With the formation of the sac, the ovule enlarges from the micropylar end, thus leaving the sac deeply embedded in the nucellus. A short beak is formed, which projects through the micropyle. Two or three rows of cells degenerate to form a passage for the pollen tube.

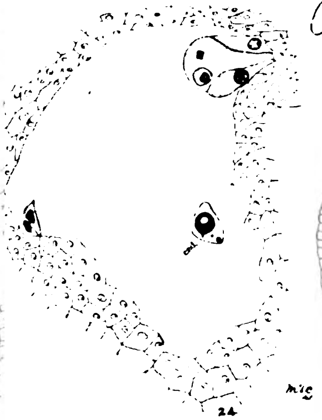
4. The embryo is at first filamentous, the basal cell being very large. The four or five cells next to the apex divide longitudinally, forming the four or five tiers of a large spherical embryo. The cotyledons and the root-tip are formed in the usual dicotyledonous method. Soon after the appearance of the cotyledons the suspensor degenerates.

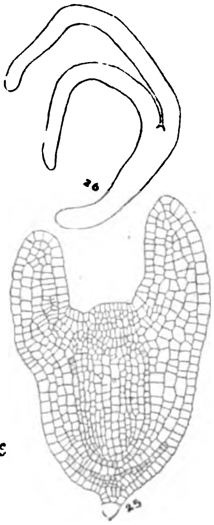
OHIO NATURALIST. *Plate 7.*



COOK on "Agrostemma githago."







EXPLANATION OF FIGURES.

For the drawings a Leitz stand was used. For Figs. 6 to 7, a No. 6 Zeiss ocular and a 1-12 Bausch and Lomb oil immersion, for Figs. 8 to 24, a No. 6 Zeiss ocular and a No. 7 Leitz objective.

Fig. 1. Two archesporial cells.
" 2. " " "
" 3. Three " " in cross section (slightly oblique).
" 4. Functional megaspore.
" 5. Two-celled embryo sac and inner zone of nucellus.
" 6. Four- " "
" 7. Eight- " " inner zone of nucellus nearly absorbed.
" 8-12. Series of embryos showing transverse division.
" 13. Embryo showing first longitudinal division.
" 14. " " second and third longitudinal divisions.
" 15. " " fourth " "
" 16. " " fifth " "
" 17. " of five tiers of cells and suspensor.
" 18. " " " " " also endosperm.
" 19. Mass of endosperm in basal pocket of embryo sac.
" 20. Spherical embryo of five tiers of cells.
" 21. " "
" 22. " " showing origin of cotyledons (c).
" 23. Ovule showing the two-celled embryo sac, the two zones of the nucellus, the radiating arrangement of the cells of the nucellus, the path to be followed by the pollen tube, and the two integuments.
" 24. Embryo sac enlarging at right angle to the long axis; e, egg and synergids; a, antipodals; end., endosperm.
" 25. Embryo showing the differentiation into cotyledons, calyptrogen, dermatogen, periblem and plerome.
" 26. Diagram of mature embryo.

ATAVISM IN THE WATERMELON.

JOHN H. SCHAFFNER.

In the summer of 1895 I noticed a peculiar variation in the leaves of a watermelon vine, growing in a patch in Clay county, Kansas. The plants were of the variety known as the "Georgia Rattlesnake," and, excepting the single plant mentioned, were of the usual type.

The leaves of the watermelon seem to be quite constant in form. They are usually described as palmately five-lobed, the lobes being mostly sinuate-pinnatifid, with all the segments obtuse (Fig. 1*b*). But in this plant the lobed condition of all the leaves was almost entirely absent, the border being only moderately undulate (Fig. 1*c*).

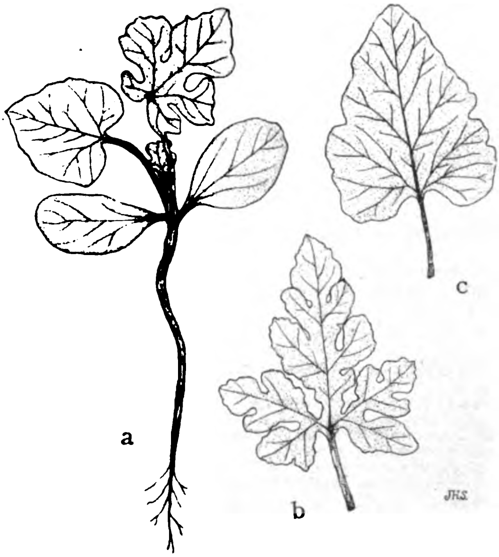


Fig. 1. *a*, A young seedling of the usual form.
b, Leaf of usual form.
c, Leaf of special form.

Some of the seed from this individual were planted in 1896, and the same leaf peculiarity was reported. The form has been successfully cultivated every year since that time, although it was usually planted in patches with the ordinary kind and much cross-pollination must have resulted.

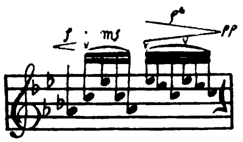
Whether this condition of entire leaves is common in the watermelon I do not know, but I regard it as a good example of atavism, or reversion to a more primitive type. Such reversions may perhaps be of frequent occurrence in the species. It is a well-known fact that the leaves of many fossil plants from the Cretaceous have entire borders, while the modern representatives of the same genera are often serrate, denticulate or lobed. Turning now to the seedling of the ordinary watermelon (Fig. 1*a*), we find that the leaves develop in succession from the entire to the mature, lobed form. The cotyledons are oval and entire, while the first leaf is almost an exact counterpart of the variety under consideration. In the second leaf the lobed condition is beginning to appear while the third leaf would have the normal form of the mature plant. On this account I regard this as a case of atavism rather than an ordinary mutation ; or it is probable that the watermelon embryo, in passing from entire to lobed leaves, is repeating some of the past stages in the history of its race. Striking variations, mutations and reversions should be carefully studied and recorded, since it is by them alone that many of the problems of evolution can be solved.

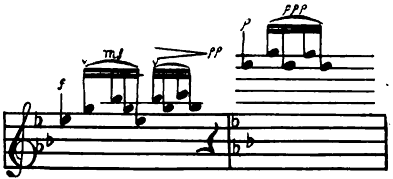
A HERMIT THRUSH SONG.

THEODORE CLARKE SMITH.

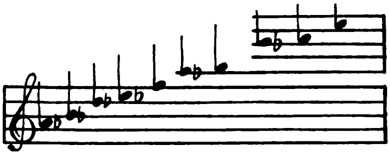
During the summer of 1902 I stayed from the twenty-fourth of June to the thirtieth of July at a camp on the shore of Lake Memphremagog. My tent was placed at the edge of a cedar and hemlock grove, mixed with occasional maples and birches which furnished nesting places for a great variety of birds. The most conspicuous singer was a hermit thrush whose nest was not far from the tent and whose song was heard every morning and evening and frequently during the day for over a month. Others of his kind were also audible, sometimes close at hand, but none became so thoroughly familiar as this "camp thrush." I have heard him at extremely close range, on one occasion from less than ten feet, and have also been able to distinguish his song, over the lake, from a distance of fully three-quarters of a mile. From an abundance of material the following notes are contributed in the effort to analyze his vocal performance :

In form the song of this thrush was very distinct, clear-cut and regular. His typical phrase was as here shown. This same form was repeated by the bird in higher keys, usually somewhat simplified by the omission of one or more of the latter notes until at the top of the bird's register it become reduced to little more than the following. The closer one approached the thrush the greater appeared the regularity, as long, that is, as the bird was in full song, for when beginning or when singing softly he departed noticeably from his ordinary practice.





On several occasions the bird sang near the camp cabin in which there was a piano, and it was a simple matter, owing to the regularity of the song, to determine the pitch with considerable accuracy. With regard to the long opening notes I speak with great confidence for I took down a long series on two occasions and found the pitch unchanged. From these observations I determined that the thrush used phrases in the following keys. I heard no others and never detected any flatting or sharping. It will be noticed that these keys form part of the scale of A flat major. In this, and in fact in the whole song, the approximation to the human scale was striking.



The hermit's song consisted, nine times out of ten, in a regular alternation of low with high phrases. Two in succession on or near the same level he never in my hearing gave, but he would sometimes ascend or descend through a series of three different keys. There was no fixed order nor any necessary key relation between successive phases. I have long lists of such and am certain that the bird uttered his theme in whatever key suited his fancy so long as it was not a repetition of the theme just uttered. For example, one series began with a low B flat followed by a high A flat, then a middle F, then an upper B flat, then dropped to low A flat, soared up two octaves to high A flat, dropped to middle B flat, then down to low E flat. This continual alteration of key was the most striking thing about the hermit's song, apart from its regularity and accuracy of pitch. It suggested somehow the orchestral handling of a theme by a musical composer, and made it beyond comparison more interesting as a performance than the simple repetitions of the olive backed thrush, or the endless variety of the thrasher.

The utterance of the theme was for all the lower forms distinct and without *portamento*. Now and then, although rarely, the bird gave his triplet or quadruplet notes a vibratory "trill," and in the very highest phrases the distinctness of vocalization was much diminished. The bird's voice never broke on its highest notes but his enunciation became somewhat indistinct, although never to such an extent as to disguise the form of his theme.

The voice of the hermit thrush was made individual by overtones giving it a considerable richness and penetration and even a metalic burr or buzz. It suggested somewhat the reed-quality of the oboe superadded to a flute's open tone. Direct comparison was possible only with the piano, a bugle and a flute, and needless to say, it was far closer to the last named, but very much more vibrant, less hollow. The "burr" was audible at short ranges only. At a hundred yards or less it blended to give the voice a singularly ringing metalic quality which gave it a carrying power unapproached by any other bird of that region. It should be said that in proportion as the bird seemed to be exerting himself, as for example on one occasion when suddenly joined by his mate, the metallic overtones were less prominent, and in certain of the key varieties they were nearly absent. The long opening notes were the freest, the high, rapid ones the most burdened with overtones. At their worst the highest figures were occasionally almost squeaky but in the full song they were by no means lacking in sweetness, and they were always clear and sharp.

Heard from a very close range the long full notes were fairly piercing, so sweet, full, and vibrant were they. They were too loud for comfort, and when the bird suddenly began to sing while perched on a fence about ten feet from my tent it fairly made my ears ring.

The most characteristic feature of the song in the line of vocal modulation was as simple as the phrase itself, but equally effective. The opening long note was struck firmly and held sometimes with a slight crescendo, but the succeeding rapid figures were progressively diminished in loudness until the last clearly uttered notes faded away in a silvery tinkle. This *smorzando* or *diminuendo* utterance was almost habitual with the "camp thrush," and was indescribably effective. It suggested the modulation of the piano player since it surpassed in extent of diminution and in delicacy of utterance at the end anything within the compass of a wind instrument. But the piano *smorzando* would lack the crescendo on the opening note.

The whole song was vigorous and sure in delivery, slow—since the phrases, taking at the most two and a half seconds in delivery, were separated by four to six seconds of silence—but perfectly steady in tempo, and certain in execution. The unusual richness and vibrant power of the tone, enhanced by the effective *smorzando* utterances of successive phrases, with the never-failing alternation of key and pitch marked the song off from any other sound of the Canadian woods.

This bird was by no means unusual, nor on the contrary identical with others of his species. His nearest neighbor differed from him in several marked ways, being less regular in song form, having much more variety in his phrases, using minor as well as major keys, being less distinct and finished in utterance although rather sweeter in voice, singing a little more slowly and a little less loudly, being rather inferior in penetration, and not using the *smorzando* delivery so much. But both were master-singers.

EARLIEST OBSERVED BIRD MIGRATIONS FOR COLUMBUS.

WALTER J. DERBY.

In compiling and arranging the list of earliest spring migrations given in this paper, the writer has simply edited the work of the older observers of the club with the hope that the list will be of interest to other workers in Ornithology and perhaps furnish a basis for more extended study along the same line.

The observations were all made during the years 1897 to 1902, and were all by members of the Wheaton Ornithological Club of the State University. A comparison of the data of spring migrations made by Mr. Frank M. Chapman at Englewood, New Jersey, which is about sixty miles farther north than Columbus, with this list shows that the arrival of northward-bound species here is from a week to ten days earlier on the average, though some of the dates coincide very closely and some of the records are from two to three weeks earlier. This difference is especially marked in the case of the Warbler migration which here reaches its height in the last week or ten days in April and the first week of May, while there the greatest flight occurs in the second and third weeks of May. The situation of Columbus is quite favorable, for lying on a north and south river it is in the track of the northward moving migrants, and is favorably located for early records. An effort was made to see whether or not the data in this table would bear out the conclusions reached by Dr. C. C. Trowbridge in his article in the September number of the *American Naturalist* on "Bird Migrations." He was led by the results of a series of long and careful observations to the conclusion that wind and not temperature was the cause of bird flights. Since, however, the data in the possession of the writer do not take systematic account of the volume of migration, the only recourse is to periods giving especially early records or an abundance of them. Another handicap to any attempts to differentiate the effects of wind direction and temperature lies in the fact that in this locality high temperature is usually coincident with southerly and south-westerly winds, and low temperature with north-west and north winds. By the courteous assistance of the local United States Weather Bureau, statistics were obtained for wind direction and mean daily temperature covering the months of April and May, from 1898 until 1902 inclusive. An examination of the list of records shows a noticeable scarcity of records in the first two weeks of April, although both the preceding and following weeks show several records. Comparison with the meteorological table shows during each year, without exception prevailing northerly winds and low temperature. This however being merely negative and possibly due to other causes can hardly be cited as strong proof. Attempts to correlate the wave of migration, extending through the latter part of April with the wind direction, can not be called successful except in one instance, that of 1902. In this year the records show a period of cold weather (Temp. 30 to 45 deg.) and prevailing northerly winds extending from the beginning of the second week in April to the middle of the third, with scarcely any records of migration. During the time from the 18th to the 22d of the month however, the wind direction shifted to the south and south-west, and the temperature rose to 60 deg. The records of the Ornithological Club for that period contain many records of migrating species, most of them for the 22d and 23d, with the statement that they are about a week early. This is the only good instance of positive evidence in the records, it seeming impossible to establish any clear connection in other instances. In the appended list the date is given, being the earliest record of its appearance by members of the Club and the name of the observer is placed after the species. Species not followed by names have been recorded by several members for the same time. The records for the Robin, Bluebird and Meadow-lark are not given, as some of these species winter here and of course it is impossible to distinguish the arrivals from the South from those wintering here.

Feb. 13.	Clangula hyemalis (Linn.) Old Squaw. Parker.
Feb. 17.	Branta canadensis, Canada Goose. Henderson.
Feb. 19.	Quiscalus quiscala aeneus, Bronzed Grackle. Kellicott.
Mch. 2.	Aegialitis vocifera, Killdeer. Smith.
	Zenaidura macroura, Mourning Dove. Smith.
Mch. 3.	Agelaius phoeniceus, Red-winged Blackbird. Tyler.
Mch. 6.	Spizella socialis, Chipping Sparrow. Smith and Cole.
Mch. 8.	Gallinago delicata, Wilson's Snipe. Morse.
Mch. 9.	Anas boschas, Mallard. Tyler.
Mch. 12.	Passerella iliaca, Fox Sparrow. Smith and Cole.
Mch. 13.	Zonotrichia albicollis, White-throated Sparrow. Smith and Cole.
Mch. 14.	Pipilo erythrophthalmus. Towhee. Morse.
Mch. 16.	Cathartes aura, Turkey Buzzard. Griggs.
	Spizella pusilla, Field Sparrow. Smith and Cole.
Mch. 17.	Turdus fuscescens, Wilson's Thrush. Parker.
Mch. 18.	Sayornis phoebe, Phoebe. Griggs.
Mch. 19.	Contopus virens, Wood Pewee. Parker.
Mch. 23.	Vireo flavifrons, Yellow-throated Vireo. Hine.
	Progne subis, Purple Martin. Morse.
	Poocaetes gramineus, Vesper Sparrow. Smith and Cole.
Mch. 24.	Tyrannus tyrannus, King Bird. Smith and Cole.
	Spiza americana, Dickcissel. Smith and Cole.
Mch. 25.	Chondestes grammacus, Lark Sparrow. Hine.
Mch. 28.	Dendroica virens, Black-throated Green Warbler. Henderson.
Mch. 29.	Empidonax minimus, Least Fly-catcher. Smith and Cole.
Mch. 30.	Scolecophagus carolinus, Rusty Blackbird. Smith and Cole.
Mch. 31.	Larus argentatus, Herring Gull. Morse.
April 3.	Anas americana, Baldpate. Taylor.
April 5.	Chaetura pelagica, Chimney Swift. Parker.

April 10. Turdus aonalaschkae pallasii, Hermit Thrush. Williamson.
April 15. Turdus mustelinus, Wood Thrush. Mills.
Chelidon erythrogaster, Barn Swallow. Jennings.
Actitis macularia, Spotted Sandpiper. Hine.
April 17. Harporhynchus rufus, Brown Thrasher. Morse.
April 18. Helmitherus vermivorus, Worm-eating Warbler. Hine.
Mniotilta varia, Black and White Warbler. Hine.
Helminthophila pinus, Blue-winged Warbler. Hine.
Dendroica aestiva, Yellow Warbler. Hine.
Polioptila caerulea, Blue-gray Gnatcatcher. Hine.
April 19. Piranga erythromelas, Scarlet Tanager. Parker.
April 20. Galeoscoptes carolinensis, Catbird.
Ammodramus savannarum passerinus, Grasshopper Sparrow. Hine.
April 22. Helminthophila chrysoptera, Golden-winged Warbler.
Dendroica virens, Black-throated Green Warbler. Williamson.
Dendroica blackburniae, Blackburnian Warbler.
Dendroica maculosa, Magnolia Warbler.
April 23. Clivicola riparia, Barn Swallow.
Seiurus noveboracensis, Water Thrush. Parker.
Ardea virescens, Little Green Heron.
Icterus galbula, Baltimore Oriole. Parker.
April 24. Dolichonyx oryzivorus, Bobolink.
Habia ludoviciana, Rose-breasted Grosbeak. Williamson.
Passerina cyanea, Indigo Bunting.
Vireo olivaceus, Red-eyed Vireo. Parker.
April 25. Helminthophila celata, Orange-crowned Warbler. Hine.
Setophaga ruticilla, Redstart. Parker.
Geothlypis trichas, Maryland Yellow-throat.
April 26. Icterus spurius, Orchard Oriole.
Helminthophila peregrina, Tennessee Warbler. Hine.
Icteria virens, Yellow-breasted Chat.
April 27. Petrochelidon lunifrons, Eave Swallow. Griggs.
April 28. Stelgidopteryx serripennis, Rough-winged Swallow. Taylor.
Turdus ustulatus swainsonii, Olive-backed Thrush. Hine.
Vireo gilvus, Warbling vireo. Taylor.
April 29. Zonotrichia leucophrys, White-crowned Sparrow. Hine.
Dendroica caerulescens, Black-throated Blue Warbler. Hine and Henderson.
May 1. Antrostomus vociferus, Whip-poor-will.
Dendroica coronata, Myrtle Warbler.
Seiurus aurocapillus, Oven-bird. Williamson.
Sylvania mitrata, Hooded Warbler. Parker.
Geothlypis formosa, Kentucky Warbler. Parker.
May 2. Dendroica palmarum, Palm Warbler. Hine.
Melospiza lincolni, Lincoln's Finch. Osborn.
May 5. Myiarchus crinitus, Great-crested Flycatcher. Teter.
May 7. Coccyzus erythrophthalmus, Black-billed Cuckoo.
Dendroica pennsylvanica, Chestnut-sided Warbler. Hine.
May 8. Vireo solitarius, Blue-headed Vireo. Parker.
Trochilus colubris, Humming Bird. Osborn.
May 12. Compsothlypis americanus, Parula Warbler. Parker.
May 13. Protonotaria citrea, Prothonotary Warbler. Hine.
Coccyzus americanus, Yellow-billed Cuckoo. Mills.
May 16. Dendroica castanea, Bay-breasted Warbler. Parker.

ENTOMOLOGICAL NOTES.

Some very practical results in the line of Mosquito warfare are presented in the "Reports on Plans for the Extermination of Mosquitoes on the North Shore of Long Island," published by the North Shore Improvement Association,* and accompanied by detailed map on large scale.

Work during the summer of 1901 is reported in detail in a carefully prepared volume, while a supplementary report is given in pamphlet form issued in the latter part of 1902. Prof. C. B. Davenport and Mr. Frank Lutz, who have been responsible for the most of the entomological work, have collected a large amount of interesting and very valuable matter relating to the habits, distribution, breeding places, migration, etc., of the mosquitoes of that region. These observations show, perhaps, as the most important result, that the greater part of the mosquitoes infesting any locality are reared in the immediate vicinity of the houses where they become troublesome ; that it is the smaller and quiet pools and the minute bodies of water that may occur in old tin cans, broken bottles, stumps, etc., rather than the larger bodies, that give them the condition to develop, and that while possible for some to be brought by winds from other parts of the island, this source of supply is of very little importance from the standpoint of health or even of annoyance. As stated by Mr. Lutz in his last paragraph, "Finally let us bear in mind that as a rule *every man is breeding his own mosquitoes, and every man should take care of his own property.* But, with it all, in a thickly populated district, many careful people can be made to suffer by the carelssness of one. Here the community, as a whole, should take a hand, and through the officers compel the proper precautions on the part of those who will not otherwise take them."

Prof. S. J. Hunter has recently issued a work on "Elementary Studies in Insect Life" from the Publishing House of Crane and Co., of Topeka, which is intended for beginning students in Entomology. It is arranged in very attractive form and should prove very stimulating to all young people who may have the opportunity to work with it. The plan is to present in detail the life-histories of two common species, species that may easily be obtained and development followed by almost any boy or girl, these followed by chapters on the habits, senses, instincts and relations of insects. There is a short summary of the insect groups and instruction in the simple methods of laboratory work. While the work is profusely illustrated and many of the figures of superior character, there are some which are decidedly inferior,

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* Distributed by Mr. Wilmot T. Cox, Sec'y North Shore Improvement Assoc., No. 49 Wall St., N. Y.

MEETING OF THE BIOLOGICAL CLUB.

ORTON HALL, March 2, 1903.

Mr. Quiroga gave a paper on his native country, Argentina. It served to call the attention of those who heard it, to the fact that Argentina is not to be compared with such Latin-American countries as Venezuela and the Central American Republics. The facts given and the pictures exhibited showed very plainly that in prosperity and commercial advancement the country is on a level with the United States. The paper took up exhaustively the geographical relations, topography, geology, physical geography, climate, agriculture, transportation, industries and education. Whenever practicable tables were given showing comparisons with the United States. In some respects, for example in the animal industries, the comparison was decidedly in favor of Argentina.

Prof. Osborn stated that as he read the census reports he made out a better case for the United States than did Mr. Quiroga.

The second paper was by Prof. Schaffner on "Mendel's Law of Heredity. He gave a short history of Mendel's work and explained the meaning of the law. In order to get the characters of only one of the parents in the offspring, the sex cells from which it comes must have been pure. If we believe that in the reduction division of the sex cells the division is longitudinal, there is no possibility of an unequal distribution of hereditary tendencies. But in a transverse division, segregation of characters is possible. In cytology there is nothing to indicate the percentage of hybrids being as Mendel found it. He thought that the ratio must be dependent rather on some balance of external conditions. He also questioned whether the statistical method was entirely reliable.

ROBERT F. GRIGGS, *Secretary.*

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